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Deposited in DRO:

06 November 2008

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Egan, M. and Bambra, C. and Petticrew, M. and Whitehead, M. and Thomas, S. and Thompson, H. (2007) 'The psychosocial and health effects of workplace reorganisation 1 : a systematic review of interventions that aim to increase employee participation or control.', *Journal of epidemiology and community health*, 61 (11). pp. 945-954.

Further information on publisher's website:

<http://dx.doi.org/10.1136/jech.2006.054965>

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Title:

The psychosocial and health effects of workplace reorganisation 1: a systematic review of organisational-level interventions that aim to increase employee control.

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Sources of Support: Economic and Social Research Council and the Chief Scientist Office of the Scottish Executive Health Department.

Word count: 4000.

Figures and tables may be published in electronic format only.

Keywords

1. Systematic review
2. Public Health
3. Employment

ABSTRACT

Objective: To systematically review the health and psychosocial effects of increasing employee participation and control through workplace organisational change, with reference to the 'Demand Control Support' (DCS) model of workplace health.

Design: Systematic review (QUORUM) of experimental and quasi-experimental studies (any language) reporting health and psychosocial effects of such interventions.

Data sources: Electronic databases (medical, social science and economic), bibliographies, and expert contacts.

Results: We identified 18 studies, 11 with comparison groups (no RCTs). Seven controlled, and four uncontrolled studies found some evidence of health benefits (especially mental health, including anxiety and depression) occurring when employee control and/or support increased or (less consistently) demands decreased. Some effects may have been short-term or influenced by concurrent interventions. Two studies of participatory interventions occurring alongside redundancies reported worsening employee health.

Conclusions: This systematic review identified evidence suggesting that some organisational-level participation interventions may benefit employee health, as predicted by the DCS model, but may not protect employees from generally poor working conditions. More investigation of the relative impacts of different interventions, implementation, and the distribution of effects across the socio-economic spectrum is required.

Word count 175

Introduction

Employment is widely considered to be an important determinant of health.[1] One of the most influential theoretical models describing this relationship is the ‘demand control support’ model of psychosocial workplace health. This hypothesises that the physical and mental health of employees are negatively associated with job demands and positively associated with control and social support in the workplace.[1][2][3][4][5] Investigation of the model’s components and their interactive effects has led some researchers to prioritise specific parts of the model (e.g. suggesting that control may have stronger associations with health than demands) [1][6][7] The model has proved influential amongst policy-makers: e.g. the 2004 English Public Health Strategy, *Choosing Health*, states that increasing job control should be considered a key task to improving population health.[8] We have conducted a systematic review of organisational-level workplace interventions that may achieve this key task.

Many observational epidemiological studies have investigated workplace demand, control and support. This evidence has often supported the model’s control dimension, but findings have been more mixed with regard to the full model.[6][9] Some commentators have highlighted potentially important individual factors not considered by the model (eg. personal modes of coping and need to control), and alternative models such as “effort-reward imbalance” have been advanced.[10] The degree to which the demand control support model explains health outcomes independently of variables such as status in the community, income, and health behaviours, has also been questioned.[12]

Intervention evaluations have been advocated as a means of testing the validity and applicability of psychosocial models and theories. Such evaluations have been called “the bullet that psychosocial epidemiology has to bite” to provide evidence for this purpose and influence policy.[13] Evaluations of interventions to improve workplace control may help us identify effective ways not only to improve employee health, but also to reduce health inequalities, as some evidence suggests a social gradient in exposure to low work control (i.e. lower occupation groups may experience less control)[14],

Karasek, a key theorist in this field, categorised workplace psychosocial interventions by distinguishing 'organisational-level' interventions aimed at changing the psychosocial environment, from 'individual-level' interventions aimed at changing the way individuals behave and cope with that environment. He argued that organisational interventions were preferable as preventative measures because they addressed the causes of unhealthy working environments.[4]

In the systematic review presented here we focus on site-specific (rather than broader legal or socio-economic transitions[4]) organisational interventions designed to increase employees' opportunities to make decisions or participate in decision-making processes at work. As managerial structures may need to change to accommodate increased employee participation and control, Karasek describes these as 'macro-level' interventions that cut across workplace hierarchies. In a companion paper we have systematically reviewed the health effects of more localised 'micro-level' organisational interventions that typically affect the daily task structures and labour divisions of specific teams of workers.[Bambra et al, unpublished data]

We know of no other systematic review that focuses on participation interventions. Existing reviews tend to take the form of broad scopes of workplace interventions, or include studies that report relatively little data on either health or psychosocial outcomes, or focus on individual-level interventions.[4][15][16][17][18][19][20][21]

Systematic reviews are increasingly advocated as a tool for identifying and synthesising evaluative evidence on the wider determinants of health and health inequalities.[22][23] Employment has been highlighted as a policy-area urgently in need of rigorous systematic reviews.[23] In this systematic review we ask whether organisational-level interventions designed to increase employee participation/control lead to health effects predicted by the demand control support model.

METHODS

Inclusion and Exclusion

We included experimental, prospective and retrospective studies evaluating the effects of specific organisational-level interventions (single or multi-interventions) intended to increase employees' opportunities to make decisions or participate in decision-making.

We only included studies that evaluated both the psychosocial and the health effects of such interventions, so that we could explore the relationship between the two. Psychosocial outcomes included self-reported demand, control and support or related measures (eg. work complexity, autonomy, satisfaction with colleagues, etc). Health outcomes included self-reported physical health, mental health, absenteeism and physical measures. Studies that only focused on workplace injuries or accidents were excluded, as were those that did not report on the psychosocial work environment beyond general job satisfaction.

Search strategy

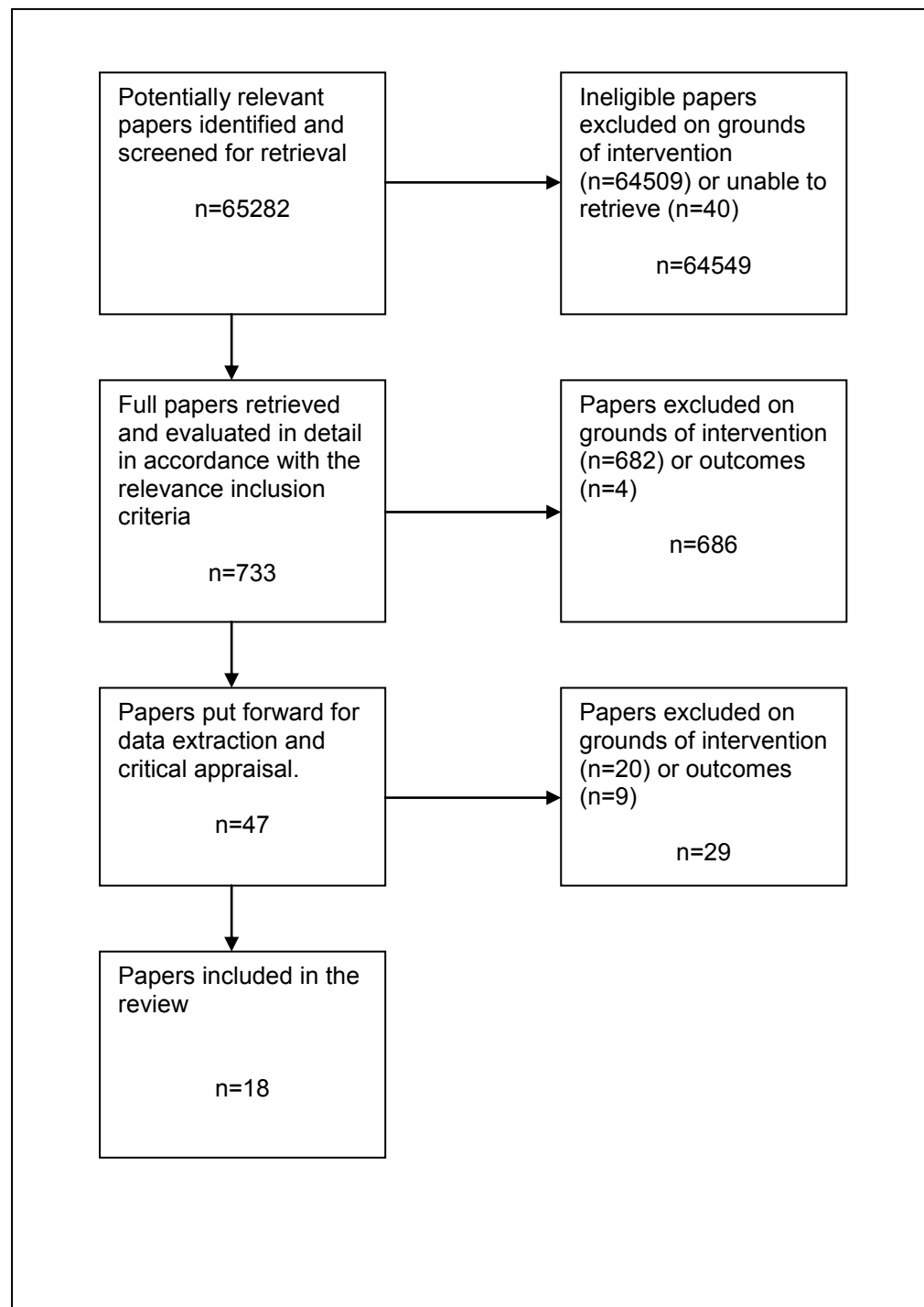
We searched for documents of any type or language from any country. We developed a sensitive search strategy employing lists of terms associated with workplace reorganisation, psychosocial outcomes and health (see our protocol: http://www.msoc-mrc.gla.ac.uk/Evidence/Research/Research_MAIN.html), and searched numerous databases from start date to November 2006 (see Panel 1). We also searched SIGLE, PAIS, Dissertation Abstracts and other internet resources, we hand searched bibliographies and contacted experts.

Panel 1: Electronic searched (hosts given in parentheses)

ASSIA (CSA)	ERIC (CSA/Dialog)
British Library catalogue	Index to theses
Business Periodicals Premier	Medline (Ovid/Dialog)
Conference Papers Index (CSA)	NTIS (free version)
COPAC	Psycinfo (Dialog/Ovid)
Econlit (Dialog/Ovid)	Social Sciences Citation Index (MIMAS)
Electronic Collections Online (OCLC firstsearch)	Sociological abstracts (CSA)
Embase (Dialog)	Zetoc.

We initially located 65282 titles and abstracts, of which 733 were retrieved for detailed examination (see Figure 1). All empirical studies of workplace reorganisations intended to change employee participation were retrieved and independently assessed by two reviewers (CB and ME) for relevance and methodological quality (Tables 1-4).

Figure 1: Search flow



Critical appraisal data extraction and synthesis

Critical appraisal criteria were adapted from the systematic review methodological literature and existing systematic reviews of public health interventions.[24][25][26][27] Data were abstracted by one reviewer (ST) and checked by another (ME). Where the data were available we calculated effect sizes and 95% confidence intervals, but it should be noted that these sometimes differed from P values reported in the original articles, possibly because our calculations relied on summarised final sample size data reported in journals, rather than original data sets. Because heterogeneity in interventions, study designs, comparison groups, outcome measures and reporting of data made meta-analysis and comparisons of effect sizes between studies problematic, we used narrative synthesis.[24][25] This involved categorising and tabulating data by intervention type, methodological characteristics, setting and outcome, and describing studies in a narrative that emphasises the findings of more methodologically robust studies (e.g. prospective, controlled studies).[28][29]

RESULTS

Eighteen studies (dates ranging from 1981-2006) were identified that examined both the health and psychosocial effects of organisational interventions aimed at increasing employee participation/control.[30][31][32][33][34][35][36][37][38][39][40][41][42][43][44][45][46][47][48] Four[30][36][40][42] were located through manual searches, the rest were identified electronically.

Most of the interventions included some form of “participatory” or “problem-solving” committees of employee representatives. These were usually established to identify ways of tackling workplace stressors, although one had wider powers in areas such as budgeting and personnel.[32] Some participatory interventions were implemented in combination with individual-level interventions[38][39][40][41], ergonomic improvements[42][43], or organisational downsizing (tables 1 to 4).[44][45][46][47][48]

We identified eleven prospective studies with non-randomised comparison groups[30][31][32][33][34][36][38][39][40][41][42][44], as well as four prospective[35][37][45][46] and three retrospective studies without comparison

groups[43][47][48] (one of which was qualitative[48]). Comparison groups typically consisted of employees from similar departments or workplaces to the intervention groups. Key findings from prospective controlled studies are summarised in the text. Tables 1-4 summarise findings from all the studies and give details of their methodological characteristics.

Single Intervention Studies

Six of seven studies evaluating the health and psychosocial effects of single participatory interventions were prospective with comparison groups.[30][31][32][33][34][35][36] (see Table 1). Apart from one case (in which workers were given more control over their working hours[36]) the interventions took the form of employee committees for identifying workplace stressors and ways to reduce them. One committee's role was semi-managerial.[32]

Two cohort studies with comparison groups had civil service settings. One examined the effects of establishing problem-solving committees comprised of managers, elected employee representatives and an external consultant, at two local government public health departments in the USA.[30] After 12 months, neither employees' adjusted mean depression scores nor rates of self-reported sleeping problems had changed significantly. There was little change ($P>0.05$) in self-reported demand, control or support (Job Contents Questionnaire (JCQ)).

The other examined the effects over 12 months of a workers' steering committee of volunteer employee representatives, moderated by an external consultant (psychologist) in a UK central government office.[31] Mean scores for 'sense of control' increased in the intervention group from 10.31 (95%CI 9.65-10.97) to 12.70 (95%CI 11.96-13.44): $P<0.0001$, in contrast to a decrease in the comparison group from 10.86 (95%CI 10.16-11.56) to 10.65 (95%CI 9.40-11.90). Mean Occupational Stress Indicator scores for mental ill health improved from 57.56 (95%CI 54.19-60.93) to 52.27 (95%CI 45.96-58.58) in the intervention group relative to the comparison group, whose scores increased from 53.19 (95%CI 49.45-56.93) to 58.96 (95%CI 53.99-63.93): $P=0.014$. The intervention group also experienced a decrease in routinely recorded sickness absence relative to the comparison group (see Table 1).

A prospective cohort study found that a participative management intervention in a hospital in the USA appeared to have little effect ($P>0.05$) on psychosocial and health outcomes.[32]

After 12 months of a 'Quality Circles' hospital intervention (involving externally moderated, problem-solving committees of employee representatives focussing on workplace stressors), a Canadian repeat cross-sectional study found improvements in mean JCQ scores for "psychological demands" (mean of differences between before and after scores: experimental group = -0.56 (95% CI: -0.94, -0.18); comparison group = -0.31 (95% CI: -0.68, 0.07); $P=0.015$); "supervisor support" (mean differences: experimental group = -0.57 (95% CI: -0.86, -0.27); comparison group = -0.92 (95% CI: -1.21, -0.63); $P=0.028$); "co-worker support" (mean differences: experimental group = -0.04 (95% CI: -0.16, 0.25); comparison group = -0.12 (95% CI: -0.32, 0.08); $P=0.056$), "reward" (mean differences: experimental group = -0.41 (95% CI: -0.01, 0.83); comparison group = -0.16 (95% CI: -0.58, 0.25); $P=0.001$), and "effort-reward imbalance" (mean differences: experimental group = -0.04 (95% CI: -0.07, -0.01); comparison group = -0.01 (95% CI: -0.04, 0.01); $P=0.002$), but little evidence of change for "decision latitude" ($P=0.382$).[33][34] Mental health indicators derived from Psychiatric Symptom Index mean scores for "psychological distress" ($P=0.205$), and self-reported sleeping problems ($P=0.210$) were inconclusive, as were Copenhagen Burnout Inventory mean scores ($P>0.8$), except for an improvement (reduction) in "work-related burnout" (mean differences: experimental group = -1.83 (95%CI: -3.58 to -0.09); comparison group = 0.06 (95%CI: -1.66 to 1.78); $P=0.034$).

A U.S. repeat cross-sectional study evaluated the effects of externally moderated 'problem-solving' committees of employee representatives in 11 retail stores.[35] Relative to employees in 10 comparison stores, the intervention group reported improvements in mean scores (Eisenberger and Worksite Health Climate Scales) for "organisational support" ($P=0.001$), "co-worker support" ($P<0.001$) "involvement with supervisors" ($P=0.02$), "overall health status" (SF12) ($P=0.004$) and "job stress" (Cohen's six item scale) ($P=0.02$) after 12 months. Inconclusive evidence of improvements were found for "involvement with others" ($P=0.06$), "communication" ($P=0.07$) and "safety and health climate" ($P=0.07$).

A prospective, repeat cross-sectional study with nested cohort study of two UK police departments found that psychological well-being (GHQ12 mean score) appeared to have improved after 6 months for workers given more control over shift rotas, compared to employees with fixed rotas ($P < 0.05$; additional numerical data not reported).[36] Changes in self-reported demand, control and physical health varied little between the two groups.

Multi-intervention Studies

Eleven studies [38][39][40][41][42][43][44][45][46][47][48] of which six were prospective with comparison groups[38][39][40][41][42][44] examined participation interventions delivered as part of packages of interventions.

Participation and individual-level interventions

Four studies evaluated employee committees combined with individual-level health promotion, education and behaviour interventions: such as anti-smoking or physical activity interventions, and training sessions on relaxation techniques, stress reduction, and communication skills. [38][39][40][41]

A prospective Norwegian hospital study[38] examined the impact of stress management and physical training sessions combined with a workers' steering committee (moderated by an external consultant) to improve health and organisational performance. After adjusting for demographic characteristics, mean JCQ scores were found to have improved after a week for 'job demands' (from 13.99 to 13.77, relative to the comparison group (12.29 to 14.86): ANCOVA, $P < 0.05$); and 'opportunity to develop' (from 32.34 to 32.68, relative to the comparison group (36.50 to 32.58): $P < 0.05$); and for mean Work Apgar Questionnaire scores for 'social support' (from 18.43 to 13.48. relative to the comparison group (20.64 to 19.21): $P < 0.05$); and 'role harmony' (from 3.86 to 4.43 relative to comparison group (4.88 to 3.93): $P < 0.05$). 'Work-related stress' (JCQ) reduced from 6.55 to 5.95 relative to the comparison group (increase from 4.07 to 7.36): $P < 0.05$.

A similar package of interventions, along with smoking restrictions, were evaluated in a Dutch prospective cohort study.[39] Individual-level interventions were implemented in a factory

between the first wave (T1) and follow-up at 12 months (T2). Organisational interventions took place between T2 and follow-up at 24 and 36 months (T3 and T4). Mean scores for 'control' (Work Stress Questionnaire) increased significantly in the intervention group (from 2.34 (95% CI 2.27,2.41) to 2.53 (95% CI: 2.48,2.58) while there was no significant change in the comparison group (from 2.50 (95% CI 2.44,2.56) to 2.54 (95% CI 2.48,2.60) between T2 and T3: $P<0.01$. Mean scores for 'psychological demands' showed no significant change in the intervention group (from 1.49 (95% CI 1.43,1.55) to 1.53 (95% CI 1.46-1.60) while there was a significant increase in demands for the comparison group (from 1.49 (95% CI 1.43,1.55) to 1.64 (95% CI 1.57,1.71) between T3 and T4: $P<0.01$. Serum cholesterol levels improved in men between T1 and T2 (men: $P=0.02$; women: $P=0.09$).

Four groups of civil servants in Sweden received a two day course on stress, healthy lifestyles and relaxation techniques.[40] Over the following 8 months, employee workgroups met (with minimal external assistance) to identify and recommend solutions to workplace stressors. A prospective cohort study with comparison group found that stimulation from and autonomy over work improved significantly in the intervention group ($P<0.01$) but remained unchanged in the comparison group. There was inconclusive evidence of an increase in perceived support from supervisors ($P<0.1$). A 6% mean reduction in the ratio between apolipoproteins B and AI (which may indicate reduced cardiovascular risk) was reported ($P<0.05$), without any concomitant change in the control group. Little evidence of effect was found for measures of total serum-cholesterol, serum-triglycerides and lifestyle factors (smoking, exercise, weight, diet and alcohol).

A prospective cohort study compared an individual-level intervention, a combined individual and organisational intervention, and a no-intervention control in 3 UK hospital departments.[41] Employees who received combined interventions reported improved 'individual innovation' at both 3 and 12 months follow-up (z-scores = -0.17 (T1), 0.01 (T2), and 0.92 (T3)) compared to employees receiving no intervention (z-scores = 0.17 (T1), -0.02 (T2) and 0.09 (T3): $P<0.001$). The authors reported little comparative change in job induced tension or psychological strain (GHQ12) amongst employees receiving the combined intervention.

Participation, task structure and ergonomic interventions

One controlled[42] and one uncontrolled study[43] evaluated participatory committees combined with ergonomic interventions: i.e. attempts to reduce physical discomfort and improve workplace safety by modifying physical environments (including technological improvements) and advising on posture and lifting.

In a Japanese factory, a committee of worksite supervisors, personnel and corporate medical staff met over several months to devise a programme to reduce worksite stressors identified by the supervisors. This involved increased team-working, overtime and ergonomic improvements.[42] After 2 years, a prospective controlled study found no significant psychosocial changes except for an increase in reports of 'work overload' relative to the comparison group (intervention group = 26% to 43%; comparison group = 28% to 26%: $P=0.054$). The authors also reported a reduction in short-term (1-5 days) absenteeism (intervention group = 52% to 34%; comparison group = 33% to 37%: $P=0.034$); and in mean Zung self-rating depression scores (intervention group = 41.1 to 38.6; comparison group = 41.5 to 42.3: $P = 0.025$, see Table 3) amongst men.

Protecting employees from negative organisational change.

Amongst five studies evaluating employee participation interventions intended to reduce the negative effects of organisational downsizing (eg. job insecurity/redundancies), only one used a prospective/comparison group design.[45] This study of a Norwegian post-office compared employees in post offices that instigated working conditions groups (involving supervisors, employees and moderated by a consultant) to a no-intervention group of post-office employees. The authors reported little difference in most psychosocial or health outcomes after one week, and none after 12 months, with the exception of 'commitment' ($P<0.05$).

Health inequalities

Studies reporting differential effects by gender and socio-economic group could potentially shed light on how interventions might be used to tackle health inequalities. Only one of the 18 studies identified in this review reported a differential effect of an intervention by gender and

this found that serum cholesterol levels improved for men but not for women (T1-T2: men: $P=0.02$; women: $P=0.09$).[39] One uncontrolled study reported that the participatory interventions preceded improvements ($P<0.05$) for black and Hispanic, but not white, employees in psychosocial outcomes but similar interactions were not obtained for overall health status and job stress.[35]

Several studies looked at a particular occupational group - manual workers, clerical staff, health professionals, police or managers – and found health improvements following some of the interventions reviewed here. Only one (uncontrolled) study compared the effects of the same intervention across two or more occupational groups. It found improvements in mean scores for strain (combined 5 point scales of anxiety-contentment, depression-enthusiasm) for manual factory workers (from 2.71 to 2.45: $P<0.01$), but not managers or clerical staff ($P>0.05$), four years after a participation intervention implemented during company downsizing.[46]

Comparing Psychosocial and Health Outcomes

Eight studies reported post-intervention increases in measures of employee participation/control.[31][37][38][39][40][41][43][46] Seven of these (including the four more robust studies[31][38][39][40]) also reported health improvements and one reported little change in health[41]. Two studies of participation interventions during downsizing reported declines in employee control: one also reported worsening health,[48] whilst the other reported no significant health effects.[44]

Reductions in demand were reported in three controlled studies[33][34][38][39] and one uncontrolled study[43], and health improved each time. However, in one controlled study health improved whilst demands increased and control and support changed little.[42] In two uncontrolled studies, health improvements occurred alongside increased demands and improved control [46] and support.[37]

Two controlled[33][34][38] and three uncontrolled studies[35][37][43] reported that improved support occurred along with improved health. One controlled study found little change in

health despite improvements in support.[44] Reduced support was found to occur with worsening health in two uncontrolled studies [45][48] and with little health impact in another [47].

DISCUSSION

Quality and availability of evidence.

This systematic review identified 18 studies that evaluated both the health and psychosocial impacts of organisational-level interventions intended to increase employee participation in workplace decision making. None of the 11 controlled studies found evidence of health deterioration, while seven[31][33][34][36][38][39][40][42] (along with 4 uncontrolled studies[35][37][43][46]) found evidence of health improvements.

Some of the reported health measures might more properly be considered proxies (eg. some “burnout” measures and bio-markers), most measures are self-reported and the time periods of monitoring these outcomes ranged from one week to four years. Adjustment for confounding was often poorly reported, absent, or limited to demographic rather than health variables. In evaluations of multiple-interventions it was generally not possible to distinguish the specific effects of organisational-level interventions most relevant to this review.

Evaluations of the health effects of complex social interventions are still relatively rare (e.g. compared to individual-level and therapeutic interventions) and often take the form of ‘natural experiments’ that involve pragmatic methodological designs. Although we identified no RCTs, the number of prospective studies with comparison groups in this review compares favourably to the evidence available for many other types of socio-structural interventions affecting health[26][49][50][51].

Research, Policy and Practice

More robust evidence is required, but the findings from this review remain broadly compatible with the UK Department of Health’s view that increasing employee control is a key task for policy-makers.[8] We found that health improvements (eg. mental health and sickness absenteeism) may sometimes result from such interventions. The only negative health effects

we identified were reported for two uncontrolled studies that may have been confounded by organisational downsizing.[45][48] Qualitative evidence suggests that job insecurity, along with communication barriers associated with workplace hierarchies, may hinder participation interventions.[48]

What little evidence is available on differential effects suggests that lower grade workers and employees belonging to ethnic minorities may benefit from participation interventions. Hence the potential of such interventions for reducing workplace health inequalities is worthy of further investigation.

Demand, Control and Support

To firmly establish whether health outcomes have been conditional on psychosocial improvements resulting from the interventions, we suggest that future prospective studies should distinguish which employees (from both the intervention and control groups) do and do not experience psychosocial improvements in demand, control or support. For the intervention to have influenced health through a psychosocial pathway, greater health improvements would be expected amongst intervention group participants who report psychosocial improvements in the work environment compared to other participants.

The evidence we identified does not report data in this way, but the findings do broadly fit health outcomes hypothesised by the demand control support model. Interventions that improved workplace control and/or workplace support tended to improve employee health. Health improvements did not occur when either control or support worsened. However, the inverse relationship between workplace demands and health posited by the model have not been born out consistently. Interventions that reduced demands also improved health, but sometimes health improved even when the intervention appeared to increase demands. We did not identify sufficient evidence to shed light on how other psychosocial factors may complicate the demand control support model (one study reported some improvements in burnout alongside reduced demands and improvements in support, rewards, effort/reward, but not control).

In an accompanying review of 'micro-level' organisational interventions focusing on employees' team structures and working tasks, we also found the demand control model to be a useful (but not infallible) predictor of health outcomes.[Bambra et al, unpublished data] However, the 'micro-level' interventions we identified tended to increase demand, decrease control and negatively affect health. In contrast, the participation interventions reviewed here usually had benign or beneficial, but not adverse, health effects (unless accompanied by redundancies).

Limitations

There are several limitations to the interpretation of the studies in the review. First, in many of the original papers the reporting of the interventions was generally poor or difficult to assess, even with the help of implementation evaluation tools.[27] There is a lack of evidence that the intended interventions were actually implemented in full, or at all. In the tables we have tried to indicate where there is doubt about the completeness of the intervention, but in many papers no clues were given about the status of implementation. Obviously, this strikes at the core of evaluation practice – what are the authors measuring if the intervention was little more than a paper exercise? We will report more fully on these implementation issues in a future paper.

Second, several of the organisational interventions aimed at changing the psychosocial environment took place at the same time as individual-level health education or ergonomic initiatives. It is generally not possible to separate out the health effects of the different types of intervention, though some of the reported health outcomes, such as reductions in injuries and changes in lifestyles such as smoking and diet, could plausibly be attributed to the intervention more directly aimed at these outcomes.

Third, five of the interventions are reported to have taken place while companies were undergoing restructuring that included downsizing and redundancies. In such cases, an absence of negative health effects may reflect a protective effect from increased participation, counteracting the negative psychosocial impacts of downsizing. A controlled study is required to test this hypothesis. The only one we identified found no evidence of health protection.

Perhaps it is unrealistic to expect the relatively modest interventions of setting up participatory committees to protect workers from substantial deteriorations in workplace conditions. Nor are they necessarily responsible for the observed health improvements amongst employees who believe they have survived a downsizing period.[46]

The hypotheses and methodological issues discussed here need to be taken into account, both in the interpretation of existing studies and the design of future intervention evaluations.

Conclusion

Participatory interventions that successfully change employee control and/or support in the workplace appear from the evidence in this review to have a more consistent impact on health outcomes than interventions that change demand. This finding fits well with evidence from observational epidemiological studies[1][6] and is compatible with policy directives such as the recently enforced EU directive on participation at work.[52]. More robust prospective studies along the lines described above, with improved reporting of intervention implementation and differential impacts for different socio-economic groups are required to provide a stronger evidence base. The evidence we did identify suggests that the strategy of re-organising workplaces to facilitate employee participation and control offers a potential means of improving employee health and well-being, although the most effective means of implementing this strategy needs to be better understood.

COMPETING INTERESTS

All authors declare that they have no competing interests.

ETHICAL APPROVAL

Ethical approval was not required for this literature review.

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What is already known on this subject

The demand control support model of psychosocial workplace health has been particularly influential amongst researchers and policy-makers interested in employee health and health inequalities.

It posits that health is positively associated with employees' sense of control and social support and negatively associated with workplace demands, suggesting that interventions which modify these work characteristics appropriately may benefit employee health.

What this study adds

First systematic review of the health effects of interventions aimed at improving employee control and/or participation in workplace decision making.

Interventions that successfully improve employees' sense of control are potentially health improving, although they cannot be expected to protect workers from generally poor working conditions.

Policy Implications

The findings support the incorporation into public health strategies of policies and interventions that aim to increase job control and autonomy amongst employees.

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Table 1: Single Interventions to Increase Employee Participation and/or Control

Study	Design & Methods Appraisal ^A	Setting & Participants	Intervention	Implementation	Psychosocial Outcomes (P<0.05) ^{B,C}	Health Outcomes (P<0.05) ^C
Landsbergis and Vivona-Vaughan (1995). ^[25]	Prospective cohort study with comparison group. Some qualitative components. 12 month follow-up. Final sample: n = 77. Methods appraisal: 1,2,3,4,7,8, 9,10.	Two local government agencies. USA. Managers, professionals, and clerical staff.	Problem-solving committees moderated by external consultant for elected employee representatives and managers.	Authors report support for the intervention from employers and employees, and that some of the committees' proposals were implemented.	Demand (D) ↔ Decision latitude (C) ↔ Work involvement (C) ↔ Influence satisfaction (C) ↔ Supervisor relations (S) ↔ Feedback (S) ↔ Co-worker support (S) ↔ Group goal clarity (O) ↔ Open group process (O) ↑	Mental health: (Job Content Questionnaire) ↔
Bond and Bunce (2001). ^[26]	Prospective cohort study with comparison group. 12 month follow-up. Final sample: n = 53. Methods appraisal: 1,2,3,4,6,7,10	Central government office. UK Civil servants: various grades.	Participative Action Research: workers' steering committee of volunteer employee representatives, set up by external consultant (psychologist).	Few reported details. Committee's proposals for more feedback opportunities in the workplace were adopted by management.	Sense of control (C) ↑ Job satisfaction (O) ↔ Self-rated performance (O) ↑	Mental ill health (OSI) score: ↑ Occupational Stress Indicator Physical health ↔ Absenteeism ↑
Counte <i>et al</i> (1987). ^[27]	Prospective cohort study with comparison group. 3 and 6 month follow-up. Final sample: n=99. Methods appraisal: 1,2,3,7,8,10	Hospital. USA. Nurses.	Participative management intervention: committees of nurses given control over personnel, work scheduling, training and some budgeting.	3 of the 4 committees were reportedly well implemented but the fourth was hindered by 'power struggles.' Many nurses preferred the traditional, hierarchical model of hospital management.	Co-worker satisfaction (S) ↔ Satisfaction with work (O) ↔	Absenteeism ↔
Bourbonnais <i>et al</i> (2006).	Prospective repeat cross-sectional study with comparison group. 12 month follow-up. Final sample: 613 Methods Appraisal: 1,2,3,4,5,6,7,8,9,10	Hospital. Canada. Nurses, orderlies and auxiliary nurses.	Participatory intervention based on the German 'Health Circles' model. Small groups composed of different types of employee representatives meeting fortnightly and led by an external moderator, to identify psychosocial stressors and recommend solutions to employees and management.	Intervention developed by researchers in consultation with nursing representatives, following assessment and observations of the workplace. Evidence of co-operation from management. Some of the less complex recommendations have 'already been applied'.	Psychological demands (D) ↑ Decision latitude (C) ↔ Supervisor support (S) ↑ Co-worker support (S) ↑ Reward (O) ↑ Effort-reward imbalance (O) ↑	Psychological distress (Psychiatric Symptom Index) ↔ Sleeping problems (Nottingham Health Profile) ↔ Client related burnout ↔ Work related burnout ↑ Personal burnout (Copenhagen Burnout Inventory) ↔

Park <i>et al</i> (2004)	Prospective repeat-cross sectional study. Baseline 6 months prior to intervention. Follow-up 1 year after intervention. Final Sample: n = 1463 Methods appraisal: 1,2,3,6,7,8,9,10	Retail store workers, USA. All employees.	Action Teams created in each intervention store in which employee representative liaised with management and employees to improve team communication and cohesiveness, work scheduling, conflict resolution, and recognising good work.	Implementation took place during a period of recession and uncertainty (no explicit references to redundancies). Authors were looking for a buffering effect rather than positive improvements. Assisted by professional facilitation, who helped build skills amongst team members.	Organizational support (S) ↑ Co-worker support (S) ↑ Involvement with others (S) ↔ Involvement with supervisors (S) ↑ Communication (O) ↔ Safety and health climate (O) ↔	Overall health status (SF12) ↑ Job Stress ↑
Smith <i>et al</i> (1998).[29]	Prospective, repeat cross-sectional study with nested cohort study with comparison groups. 6 month follow-up. Final sample n = 62. Methods appraisal: 1,3,4,7,8,9,10.	Police station. UK. Police officers.	Flexible working hours, compared to more rigid 12 hour shift schedules.	Few reported details on effectiveness of implementation or commitment of employers. Around 50% of employees supported the intervention.	Workload (D) ↔ Work-pace control (C) ↔ Satisfaction with rota (O) ↑	Mental health (GHQ12 mean score) ↑ Physical health (Physical Health Questionnaire) ↔
Wall and Clegg (1981).[28]	Prospective cohort study. 6 and 18 month follow-ups. Final sample n = 29. Methods appraisal: 1,2,4,5,7,9,10	Factory. UK. Manual workers.	Immediate control over production transferred to employee work groups with a steering group of representatives overseeing change.	Authors suggest that both employees and employers supported the intervention as a means of improving employees' moral.	Work complexity (D) ↓ Autonomy (C) ↑ Group identity (S) ↑ Work motivation (O) ↑ Job satisfaction (O) ↑	Mental health (20 item GHQ mean scores) ↑

^A Methods appraisal: 1= prospective; 2= representative sample; 3= appropriate comparison group; 4= baseline response >60%; 5= follow-up >80% in cohort, >60% in cross-section; 6= adjustment for non-response and drop-out; 7= conclusions substantiated by data; 8=adjustment for confounders; 9= all intervention group exposed, non-contaminated comparison group; 10= appropriate statistical tests.

^B D = Demand; C = Control; S = Social Support; O = Other psychosocial outcome measures.

^C ↑ = improvement; ↓ = worsening; ↔ = little change/inconclusive (with reference to the DCS hypothesis that reduced demands and improved control and support are 'improvements')

Table 2: Participatory and Individual-level Interventions.

Study	Design & Methods Appraisal ^A	Setting & Participants	Intervention	Implementation	Psychosocial Outcomes (P<0.05) ^{B,C}	Health Outcomes (P<0.05) ^C
Mikkelsen <i>et al</i> (2000).[30]	Prospective cohort with comparison group. Follow-up 1 week after completion of intervention. Final sample n = 82. Methods appraisal: 1,2,3,4,5,7,8,10.	Two hospitals. Norway. Various health professionals, clerical, technical and managerial staff.	Workers' steering committees moderated by external consultant. Individual-level stress management and physical training.	Mixed support for intervention from managers and staff. Intervention was dropped after evaluation.	Job demands (D) ↑* Role harmony (D) ↑* Decision authority (C) ↔ Autonomy (C) ↔ Opportunity to develop (C) ↑* Social support (S) ↑* Team style (S) ↔ Contentedness (O) ↑*	Mental health (Job Content Questionnaire). ↑* Self-reported 'health complaints'. ↔
Maes <i>et al</i> (1998).[31]	Prospective cohort with comparison group. 1, 2 and 3 year follow-up. Individual-level interventions in year one. Organisation changes after year one. Final sample: n = 264. Methods appraisal: 1,2,3,4,6,7,9,10.	Factory. Netherlands. Manual workers and other staff.	Consultative committee (employees, managers and researchers) to discuss organisational change. Concurrent health promotion programme (smoking and physical activity) and psychosocial skills training.	Authors provide few details on implementation although employees were said to have been consulted and participation was voluntary.	Psychological demands (D) ↑ Control (C) ↑ Social support (S) ↔ Ergonomic conditions (O) ↑	Serum cholesterol levels in men. ↑ Absenteeism. ↑ Mental health (5 Symptom Checklist-90). ↔ Healthy lifestyles (smoking, exercise, alcohol diet, sleep, BMI,). ↔
Orth-Gomér <i>et al</i> (1994).	Prospective cohort with comparison group. 3 and 8 month follow-up (8 month only for comparison group). Final sample: n = 121. Methods appraisal: 1,2,3,5,7,8,9,10.	Five work groups of civil servants. Sweden. Specific job details not reported.	2 day educational course (on work stress, lifestyle factors and relaxation techniques). Employee work groups to increase control and support and reduce strain in the work environment.	'In many cases' managers allocated extra-time for this intervention. However, work group members often met during breaks and in their own time. The work groups were largely autonomous, but were assisted in monthly follow-up sessions by researcher-trained health workers.	Stimulation from and autonomy over work (C) ↑ Perceived support from supervisors (S) ↔ Other factors contributing to 'work strain' and social support (details not reported) (O/S) ↔	Net changes in total serum-cholesterol. ↔ Serum-triglycerides. ↔ Serum-apolipoprotein AI and serum-apolipoprotein B ratio. ↑ Lifestyle factors (smoking, exercise, weight, diet and alcohol). ↔
Bunce and West (1996).[32]	Prospective cohort comparing two interventions in two sites with a 'no intervention' comparison site. 3 and 12 months follow-up. Final sample n = 117. Methods appraisal: 1,2,4,6,7,8,9,10.	Hospital. UK. Health professionals and clerical staff.	Site A: individual-level stress management training and sessions for employees to propose stress reducing innovations to their work. Site B: Stress management training only.	Authors provide few details on the degree to which proposed innovations were accepted by management. They refer to organisational constraints impeding the innovation group	Individual innovation (C) ↑ Propensity to innovate (C) ↔	Mental health (GHQ12). ↔

^A Methods appraisal: 1= prospective; 2= representative sample; 3= appropriate comparison group; 4= baseline response >60%; 5= follow-up >80% in cohort, >60% in cross-section; 6= adjustment for non-response and drop-out; 7= conclusions substantiated by data; 8=adjustment for confounders; 9= all intervention group exposed, non-contaminated comparison group; 10= appropriate statistical tests.

^B D = Demand; C = Control; S = Social Support; O = Other psychosocial outcome measures.

^C ↑ = improvement; ↓ = worsening; ↔ = little change/inconclusive (with reference to the DCS hypothesis that reduced demands and improved control and support are 'improvements')

* Short-term effects (1 week after intervention).

Table 3: Participation, task structure and ergonomic interventions

Study	Design & Methods Appraisal ^A	Setting & Participants	Intervention	Implementation	Psychosocial Outcomes (P<0.05) ^{B,C}	Health Outcomes (P<0.05) ^C
Kawakami <i>et al</i> (1997).[33]	Prospective cohort study with comparison group. 1 year and 2 year follow-up. Final Sample n = 187 Methods appraisal: 1,2,3,4,5,7,8,9,10.	Factory. Japan. Manual workers.	Stress-reduction "working committee" comprising of worksite supervisors, personnel staff and corporate medical staff. More and smaller teams with sub-supervisors and more on the job training; and ergonomic improvements.	Authors report that employers supported the intervention although one aspect (on the job training) was not fully implemented. Prior support from employees is not reported.	Work overload (D) ↓ Control (C) ↔ Problems with co-workers (S) ↔ Problems with supervisors (S) ↔ Chance to learn (O) ↔	Mean depression (Zung SDS score) ↑ Absenteeism ↑ Systolic blood pressure ↔ Diastolic blood pressure ↔
Evanoff <i>et al</i> (1999).[34]	Retrospective, repeat cross-sectional study (with 'pre-' and 'post-' routine data analysis on absenteeism). Baseline 1 month after intervention. 6 and 14 month follow-up. Final sample n = 87. Methods appraisal: 2,4,5,7,10	Hospital. USA. Hospital orderlies.	Participatory ergonomics team consisting of three orderlies and one supervisor. Ergonomic interventions include new procedures and training for heavy lifting and limited use of mechanical aids. Stated aim was to reduce injury rates.	Few reported details on effectiveness of implementation or commitment of employers or employees.	Psychological stressors (D/C: combined measures). ↑ Social support (S) ↑ Job satisfaction (O) ↑	Self-reported muscular-skeletal illness. ↑ Absenteeism ↑

^A Methods appraisal: 1= prospective; 2= representative sample; 3= appropriate comparison group; 4= baseline response >60%; 5= follow-up >80% in cohort, >60% in cross-section; 6= adjustment for non-response and drop-out; 7= conclusions substantiated by data; 8=adjustment for confounders; 9= all intervention group exposed, non-contaminated comparison group; 10= appropriate statistical tests.

^B D = Demand; C = Control; S = Social Support; O = Other psychosocial outcome measures.

^C ↑ = improvement; ↓ = worsening; ↔ = little change/inconclusive (with reference to the DCS hypothesis that reduced demands and improved control and support are 'improvements')

Table 4: Participatory Interventions and Downsizing

Study	Design & Methods Appraisal ^A	Setting & Participants	Intervention	Implementation	Psychosocial Outcomes (P<0.05) ^{B,C}	Health Outcomes (P<0.05) ^C
Mikkelsen and Saksvik (1999).[35]	Prospective cohort study with 2 intervention groups and two comparison groups. One week and 12 months follow-up. Final sample n = 125. Methods appraisal: 1,2,3,4,5,7,8,10..	Post office depot. Norway. Manual and clerical workers	Conference on working conditions followed by supervisor and employee workgroups meeting two hours a week, 9 times: intervention was moderated by consultants. Intervention took place during period of company downsizing.	Authors report that union and management helped design intervention. In one department, the intervention was not successfully implemented because steering group members lost interest, and personnel were relocated or made redundant.	Job demands (D) ↔ Skill discretion (C) ↔ Decision authority (C) ↔ Laissez-faire (C) ↓* Social support (S) ↔ Individual consideration (S) ↑* Job satisfaction (O) ↔ Management style (O) ↔ Opportunity to develop (O) ↔ Contentedness (O) ↔ Learning climate (O) ↔ Intellectual stimulation (O) ↑*	Self-reported job stress ↔ Self-reported health complaints ↔ Self-reported trait anxiety ↔
Woodward <i>et al</i> (1999).[36]	Prospective, cohort study. 1 year and 2 year follow-up. Final sample n = 346. Methods appraisal 1,2,4,6,7,8,9,10.	2 teaching hospitals. Canada. Managers, doctors, nurses, clerical and technical staff.	Management-employee design teams set up to implement 're-engineering' of hospital services, including a merger and (mostly management) redundancies. Staff required to reapply for posts.	Few reported details on effectiveness of implementation or commitment of employers or employees to employee participation.	Demands (D) ↓ Role clarity (D) ↓ Decision latitude (C) ↔ Job influence (C) ↔ Co-worker support (S) ↓ Supervisor support (S) ↓ Team work (S) ↓ Job insecurity (O) ↓	Mean emotional exhaustion (Maslach Burnout Inventory) ↓ Mean anxiety (10-item State Anxiety Scale) ↓ Mean depression (10-item scale) ↓
Parker <i>et al</i> (1997).[37]	Prospective, cohort study. Four year follow-up. Methods appraisal: 1,2,4,6,7,8,9,10. ^A Final sample: 139.	Factory. UK. Managerial, clerical, manual employees.	'Empowerment initiative': multi-skilling, management restructuring, work teams and greater emphasis on employee development. Company downsizing at all levels, but particularly for clerical and manual workers.	Few reported details on implementation although an independent body (Investors in People) judged the empowerment initiative to have been a success.	Demands all↑ (D) ↓ Demands manual↑ (D) ↓ Role clarity all↑ (D) ↔ Role clarity manual↑ (D) ↔ Control all↑ (C) ↑ Control manual↑ (C) ↔ Participation all↑ (C) ↑ Participation manual↑ (C) ↑ Satisfaction all↑ (O) ↔ Satisfaction manual↑ (O) ↑	Combined mean score: anxiety-contentment, depression-enthusiasm (all)* ↔ Combined mean score: anxiety-contentment, depression-enthusiasm (man.)* ↑
Heaney <i>et al</i> (1993).[38]	Retrospective, cohort study. 6 year follow-up. Final sample n = 277. Methods appraisal: 2,4,6,7,9,10. ^A	Factory. USA. Manual employees and supervisors.	Participatory Action Research Committee (representing management, union and researchers) helped establish a Stress and Wellness Committee (made up of employee representatives). Downsizing and creation of hierarchical management structure in one department (Site 1), whilst another (Site 2) maintained a more 'co-operative,' less hierarchical structure.	Authors report a lack of support from higher management and union representatives, especially in site 1.	Participative climate (C) ↔ Participation (C) ↔ Co-worker instrumental support (S) ↔ Co-worker emotional support (S) ↔ Supervisor instrumental support: (S) ↔ Supervisor emotional support (S) ↓	Mean scores for depressive symptoms (Centre for Epidemiological Studies Depression (11 items scale, 1-3 points): ↔

Herting <i>et al</i> (2003).[39]	Qualitative, retrospective panel study based on a series of indepth interviews. A randomly selected panel of 6 secretaries received 3 interviews each over time. T1= 3 months after restructuring, T2=15 months after, T3=27months after. Final sample: n = 6.	Hospital. Sweden. Clerical staff.	a) 'Collaboration meetings' between clerical and professional employees. b) labour saving ergonomic changes c) downsizing linked with restructuring.	Restructuring prompted by government cost-cutting. Degree to which managers supported the participatory intervention is not clear. Mixed response from clerical workers to the intervention.	Respondents report that they have too much work (D). Respondents report that they feel a loss of control (C). Respondents Report communication problems and feelings of inferiority when dealing with senior staff (S).	↓ ↓ ↓	Mental health: respondents report feeling 'close to tears'; lacking 'joy' and 'motivation'; becoming 'irritable' and 'snappy'; poor sleep; lack of energy; feelings of shame and frustration.	↓
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^A Methods appraisal: 1= prospective; 2= representative sample; 3= appropriate comparison group; 4= baseline response >60%; 5= follow-up >80% in cohort, >60% in cross-section; 6= adjustment for non-response and drop-out; 7= conclusions substantiated by data; 8=adjustment for confounders; 9= all intervention group exposed, non-contaminated comparison group; 10= appropriate statistical tests.

^B D = Demand; C = Control; S = Social Support; O = Other psychosocial outcome measures.

^C ↑ = improvement; ↓ = worsening; ↔ = little change/inconclusive (with reference to the DCS hypothesis that reduced demands and improved control and support are 'improvements')

* Short-term effects.

† All = manual, clerical and managerial staff; Manual = Manual staff (for whom separate figures are given because their mental health appeared to improve following the intervention).